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(54) CATHODE ELECTROACTIVE MATERIAL, THE MANUFACTURING PROCESS, AND NON-AQUEOUS SOLVENT SECONDARY BATTERY USING THE MATERIAL

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a high performance active material having a large capacity and an excellent charge - discharge cycle performance and a secondary battery using the material above.

SOLUTION: A compound expressed by a chemical formula: $Li_{1-X-a}A_XNi_{1-Y-b}B_YO_2$, (wherein A is Sr or Ba, or at least two kinds of alkaline earth metal elements selected among Mg, Ca, Sr and Ba, B comprises at least one kind of transition metal elements except Ni. In the formula, X and Y are defined as: $0<X\leq0.10$, $0<Y\leq0.30$, while a and b are defined as: $-0.10\leq a\leq0.10$, $-0.15\leq b\leq0.15$. Here, X and Y represent the total quantity of A and B in mol, respectively. If A comprises two or more kinds of alkaline earth metal elements, X represents the total quantity of alkaline earth metal elements. And if B comprises two or more kinds of transition metal elements, Y represents total quantity of transition metal elements except Ni in mole).

CLAIMS

[Claim(s)]

[Claim 1] The positive electroactive material expressed by a chemical formula; $Li_{1-X-a}A_XNi_{1-Y-b}B_YO_2$ (wherein A is Sr or Ba, or at least two kinds of alkaline earth metal elements selected among Mg, Ca, Sr and Ba, B comprises at least one kind of transition metal elements except Ni. In the formula, X and Y are defined as: $0<X\leq0.10$, $0<Y\leq0.30$, while a and b are defined as: $-0.10\leq a\leq0.10$, $-0.15\leq b\leq0.15$. Here, X and Y represent the total quantity of A and B in mol, respectively. If A comprises two or more kinds of

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alkaline earth metal elements, X represents the total quantity of alkaline earth metal elements. And if B comprises two or more kinds of transition metal elements, Y represents total quantity of transition metal elements except Ni in mole)

[Claim 2] The positive electroactive material according to Claim 1 characterized by A being Sr or Ba.

[Claim 3] The positive electroactive material according to Claim 1 characterized by A being at least two or more sorts of alkaline-earth-metal elements chosen from Mg, Ca, Sr and Ba.

[Claim 4] The positive electroactive material according to Claim 1 characterized by being $0< X\leq 0.08$.

[Claim 5] The positive electroactive material according to Claim 1 characterized by being $0< X\leq 0.05$.

[Claim 6] The positive electroactive material according to Claim 1 characterized by being $0< Y\leq 0.25$.

[Claim 7] The positive electroactive material according to Claim 1 characterized by being $0< Y\leq 0.20$.

[Claim 8] The positive electroactive material according to Claim 1 characterized by being $-0.05\leq a\leq 0.05$.

[Claim 9] The positive electroactive material according to Claim 1 characterized by being $-0.02\leq a\leq 0.02$.

[Claim 10] The positive electroactive material according to Claim 1 characterized by being $-0.08\leq b\leq 0.08$.

[Claim 11] The positive electroactive material according to Claim 1 characterized by being $-0.04\leq b\leq 0.04$.

[Claim 12] The manufacturing method of the positive electroactive material according to Claim 1, wherein a starting raw material containing lithium or A is added to a starting raw material containing nickel or B in the stoichiometric ratio of 1.05 to 1.25 to the latter, and the non-reacted alkaline components are removed after the raw materials are fired in oxygen atmosphere.

[Claim 13] The manufacturing method of the positive electroactive material according to Claim 12, wherein the removal of the said alkaline components is carried out by washing with water.

[Claim 14] The manufacturing method of the positive electroactive material according to Claim 1, wherein a starting raw material containing lithium or A is added to a starting raw material containing nickel or B in the stoichiometric ratio of 0.90 to 1.00 to the latter, and the non-reacted alkaline components are removed after the raw materials are fired in oxygen atmosphere.

[Claim 15] The non-aqueous-solvent rechargeable battery characterized by using the positive electroactive material according to Claim 1.

[Claim 16] Non-aqueous-solvent rechargeable battery which consists of the negative electrode using the electroactive material which has irreversible capacity, and the positive electrode which consists of the positive electroactive material and lithium cupper complex oxide expressed with chemical formula; Li_2CuO_2.

[Claim 17] The non-aqueous-solvent rechargeable battery according to Claim 16 characterized by the positive electroactive material according to Claim 1.

[Claim 18] The non-aqueous-solvent rechargeable battery according to Claim 15 or 16 characterized by using the positive active material manufactured by the method according to Claim 12 to 14.
[Claim 19] The non-aqueous-solvent rechargeable battery according to Claim 15 or 16 characterized by using a carbonaceous material for a negative-electrode active material.
[Claim 20] The non-aqueous-solvent system rechargeable battery according to Claim 15 or 16 characterized by the carbonaceous material being a carbon fiber.
[Claim 21] The non-aqueous-solvent system rechargeable battery according to Claim 15 or 16 characterized by a carbon fiber of which the mean length is 100 micrometers or less.